

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-114554

(43)Date of publication of application : 07.05.1993

(51)Int.Cl. H01L 21/027
B05C 11/08

(21)Application number : 03-302451

(71)Applicant : TOKYO ELECTRON LTD

(22)Date of filing : 22.10.1991

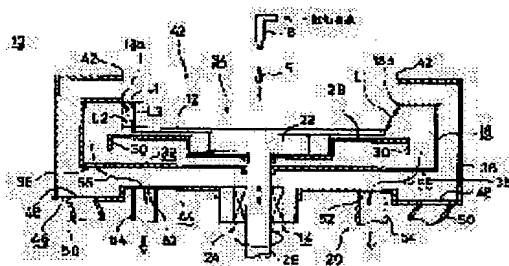
(72)Inventor : OMORI TSUTAE

(54) PROCESSING DEVICE

(57)Abstract:

PURPOSE: To apply a processing liquid in a uniform thickness by suppressing the disturbance of an air current at the time of rotationally applying the liquid.

CONSTITUTION: In this processing device which applies a processing liquid 5 to a plate-like object 12 to be processed, a rotary holding means 14 which supports the object 12 formed to a polygonal shape other than circles and a processing liquid supplying means 16 which is positioned above the means 14 and supplies the processing liquid 5 are provided. In addition, a rotary container 18 which contains the object 12 and rotates together with the object 12 and an exhausting means which sets the distance between the opened end section 18a of the container 18 and periphery of the object 12 so that the distance can become the same along the outer peripheral direction of the object 12 and, at the same time, discharges the air contained in the container 18 are also provided. Then the air contained in the container 18 is discharged without allowing the air to be disturbed.



LEGAL STATUS

[Date of request for examination] 03.02.1997

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 2906783

[Date of registration] 02.04.1999

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's

decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

*** NOTICES ***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The processor which is characterized by providing the following and which is characterized by constituting like. A rotation maintenance means to hold possible [rotation of the plate-like processed object fabricated in the shape of / except circular / a polygon]. A processing liquid supply means to supply processing liquid to the front face of the aforementioned processed object held by the aforementioned rotation maintenance means. The tumbler which has the opening edge where the distance between the periphery sections of this processed object becomes the same substantially along the direction of a periphery, and rotates in one with the aforementioned processed object, holding the aforementioned processed object held at the aforementioned rotation maintenance means. An exhaust air means to exhaust the atmosphere in the aforementioned tumbler.

[Translation done.]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to a processor.

[0002]

[Description of the Prior Art] In the manufacturing process of general and LCD (liquid crystal display) equipment, in order to form detailed patterns, such as an ITO (Indium Tin Oxide) thin film and an electrode pattern, lithography technology including a series of photoengraving-process processes of resulting [from a photoresist application process] in exposure and development is used. And as coating equipment which applies a photoresist, the equipment shown, for example in drawing 4 is known.

[0003] The LCD substrate 2 of the comparison-large area which drawing 5 showed the outline perspective diagram of conventional coating equipment, and was fabricated a rectangle or in the shape of a rectangle Suction maintenance is carried out by the vacuum chuck at the upper-limit section of the chucking 4 prepared in the center section possible [rotation]. this substrate 2 In case the up opening is held near the opening of the inside container 6 made by the round shape and carries out the diffusion application of the photoresist using a centrifugal force, it is constituted so that it may rotate in one with the above-mentioned substrate 2. Thus, if rotation coating of the rectangle-like LCD substrate is carried out, although a film with the uniform thickness which was very excellent will be formed in the portion equivalent to the inscribed circle of the substrate of the shape of this rectangle, in order to become the inclination which forms an uneven film in the other periphery and to abolish this heterogeneity, it is the purpose which reduces disorder of the air current produced at the time of rotation as much as possible, and a substrate 2 and ** are made to rotate the inside container 6 as mentioned above. Moreover, the suction exhaust air of the atmosphere in the inside container 6 is carried out from the lower part. And the outside container 8 makes it fix to the outside of this inside container 6, and it is prepared in it so that the upper part may be opened wide and this whole may be covered. Moreover, as shown in JP,57-63166,A as other conventional equipments, while preparing a rotary head with a larger area than a processed object substrate, the crevice-like substrate hold section is formed in this upper surface, and the equipment which prevented that the turbulent flow of air occurred on the upper surface of a square or rectangle-like substrate at the time of a rotation application is known.

[0004]

[Problem(s) to be Solved by the Invention] By the way, if it is in the conventional coating equipment shown in above-mentioned drawing 5 In order to suppress disorder of the air current produced at the time of rotation, in spite of making it rotate the inside container 6 and the LCD substrate 2 in one To the LCD substrate 2 being a rectangle-like, since the opening configuration of the inside container 6 is circular The distance between the periphery section of this substrate 2 and the opening edge of the inside container 6 could differ and come by each point of the periphery section of a substrate 2, the disorder of an air current arose harder at the time of rotation, and it was induced, the recoil, i.e., the splash back, of a photoresist, and had the improving point that the yield fell.

[0005] Although the problem of the splash back of the above-mentioned photoresist was hardly conspicuous and did not turn into a problem when the size of the LCD substrate 2 was small, solution of the trouble which it becomes impossible for the LCD substrate to have disregarded to technical innovation and ** under the situation of having enlarged with 300x400mm of every direction, and it described above to them is desired strongly. Moreover, if it is in equipment conventionally which is shown in the above-mentioned official report, although the upper surface of a processed object has hardly projected from the upper surface of a rotary head, it is difficult to be influenced by change of the air current of the periphery of this equipment, and to prevent generating of a turbulent flow completely. this invention is originated paying attention to the above troubles that this should be solved effectively. The purpose of this invention is to offer the processor which can suppress disorder of the air current at the time of a rotation application, and can apply processing liquid to uniform thickness.

[0006]

[Means for Solving the Problem] A rotation maintenance means to hold possible [rotation of the plate-like processed object fabricated in the shape of / except circular / a polygon] in order that this invention may solve the above-mentioned trouble, A processing liquid supply means to supply processing liquid to the front face of the aforementioned processed object held by the aforementioned rotation maintenance means, The tumbler which has the opening edge where the distance between the periphery sections of this processed object becomes the same substantially along the direction of a periphery, and rotates in one with the aforementioned processed object, holding the aforementioned processed object held at the aforementioned rotation maintenance means, It constitutes so that it may have an exhaust air means to exhaust the atmosphere in the aforementioned tumbler.

[0007]

[Function] Since this invention was constituted as mentioned above, being held at a rotation maintenance means and rotating in one within a tumbler in this state, the plate-like processed object fabricated in the shape of a polygon diffuses the processed liquid supplied from the processed liquid supply means with a centrifugal force, and a processed object applies processing liquid to a substrate front face. Since the suction exhaust air of the inside of a tumbler is carried out by the exhaust air means from the lower part at the time of this rotation application and the configuration of opening of a tumbler is made by the slightly larger similarity configuration than the configuration of a substrate It becomes possible to, set up the distance between the periphery section of the above-mentioned processed object, and the opening edge of a tumbler almost similarly in every point of the periphery section of a processed object, therefore for disorder to hardly arise in an air current at the time of these rotations, and to suppress the recoil of processing liquid.

[0008]

[Example] Below, one example of the processor concerning this invention is explained in full detail based on an accompanying drawing. The partial fracture plan showing the processor which drawing 1 requires for this invention, the cross section of the equipment which shows drawing 2 to drawing 1 , the outline perspective diagram of the equipment which shows drawing 3 to drawing 1 , and drawing 4 are the perspective diagrams showing the processor set unit in which the photoresist coater etc. was carried. In this example, the photoresist coater 10 is shown as a processor so that it may illustrate, and the case where a photoresist is applied to the 4 square-shape-like LCD substrate 12 as processing liquid as a plate-like processed object fabricated in the shape of [except circular] a polygon is explained. As shown in drawing 4 , this photoresist coater 10 It is covered by the case which can open and close the whole and is carried in the processor set unit 70. to this set unit 70, as other associated equipment The LCD substrate as a processed object from the carrier station 72 side after the brush scrubbers 74 and 74 of the couple for carrying out brush washing, and this brush washing with high-pressure jet water In order to heat the high-pressure jet soaping machines 76 and 76 of the couple for washing, and a LCD substrate Before applying a photoresist to two or more hot plate machines 78 and a LCD substrate, the edge remover 82 grade which removes the unnecessary photoresist of the ad HYUJON processing machine 80 which carries out hydrophobing processing of this, and the edge

section after a photoresist application is prepared. In order to deliver by conveying a LCD substrate between each above-mentioned equipment, the main arms 84 and 84 of a couple with the presser foot stitch tongue are formed in the center section of this set unit 70 possible [movement] along with the unit longitudinal direction. This photoresist coater 10 is mainly constituted by exhaust air means 20 to exhaust the atmosphere in this, the tumbler 18 which rotates in one, and this tumbler 18, holding a rotation maintenance means 14 to hold possible [rotation of the above-mentioned LCD substrate 12], a processing liquid supply means 16 to supply a photoresist to the front face of the above-mentioned substrate 12, and the above-mentioned substrate 12.

[0009] Specifically, the above-mentioned rotation maintenance means 14 has the chucking 22 which carries out suction maintenance of the above-mentioned substrate 12 by the vacuum chuck, and this chucking 22 is attached in the point of the axis of rotation 26 supported by bearing 24 possible [rotation]. While this axis of rotation 26 is connected with a motor through the timing belt which is not illustrated, it is made possible by up and down in the vertical direction, and when it rises, the above-mentioned substrate 12 will be delivered. The substrate 12 by which suction maintenance is carried out is fabricated as mentioned above by this chucking 22 four square shapes or in the shape of a rectangle, for example, it has a comparatively big area of about 300x400mm of every direction. And an above-mentioned processing liquid supply means 16 to supply a photoresist on a substrate as processing liquid above the central point of the above-mentioned chucking 22 is established possible [movement in a longitudinal direction].

[0010] moreover, the axis of rotation 26 of the lower part of the above-mentioned chucking 22 is made to estrange the whole undersurface of the above-mentioned substrate 12 more slightly than this, and it is worn to it — as — covering on a disk — a member 28 attaches and is being fixed, and the periphery section is crooked downward and constitutes the gas guidance wall 30 furthermore, the upper part fabricates the above-mentioned tumbler 18 like the container of the shape of a closed-end cylinder object by which opening was carried out — having — **** — the interior — the above-mentioned substrate 12, chucking 22, and covering — while holding a member 28, the above-mentioned axis of rotation 26 is made to penetrate, and it is attached and fixed, and the core of the bottom 32 is constituted so that it may rotate in one with the above-mentioned substrate 12 grade The configuration of the up opening 34 of this tumbler 18 is made by the shape of a rectangle of a slightly larger analog than the substrate 12 of the shape of an above-mentioned rectangle, therefore the distance between the periphery section of a substrate 12 and opening edge 18a of a tumbler 18 is set up so that it may become the same almost altogether substantially in each point of the substrate periphery section.

[0011] It is set up so that the horizontal distance L2 between this opening 18a and the substrate periphery section may be set to about 6mm, a vertical distance L3 may be set [in / this example / specifically, are installed so that a substrate 12 may be caudad located more slightly than opening edge 18a of a tumbler 18 at the time of substrate wearing to the above-mentioned chucking 22, and] to about 7mm and it may become an abbreviation same value over the perimeter of a substrate. Moreover, the air hole 36 for passing the drain of the photoresist shaken off by rotation and the atmosphere in a tumbler 18 separates a predetermined interval to the periphery of the pars basilaris ossis occipitalis 32 of this tumbler 18 along with the hoop direction, and are formed in it. [many] Furthermore, only distance makes the whole tumbler 18 formed in this way estrange suitably with the outside fixed cylinder-like-object-with-base object-like container 38 with which opening of the upper part was carried out, it is covered, and the core is being fixed to the bearing case 40.

[0012] The up opening 42 of this outside fixed container 38 is fabricated by the circle configuration made more greatly than the opening 34 of the above-mentioned tumbler 18. Moreover, it is the pars basilaris ossis occipitalis 44 of this outside fixed container 38, and the drain reservoir 46 fabricated by the cross-section concave is formed in the portion corresponding to the lower part of the air hole 36 of the pars basilaris ossis occipitalis of the above-mentioned tumbler 18 along with the hoop direction. And while two drain mouths 48 are formed in this example, the drain pipe 50 is connected to these drains mouth 48, and it is

constituted by this drain reservoir 46 so that the drain of the shaken-off photoresist can be discharged. Furthermore, the exhaust pipe 54 which interposed in these exhaust ports 52 the vacuum pump which is not illustrated while two exhaust ports 52 were formed by the point symmetry to the axis of rotation 26, if it was in this example is connected to the pars basilaris ossis occipitalis 44 inside the above-mentioned drain reservoir 46, and it is constituted so that suction eccentricity can be carried out out of equipment through the air hole 36 which prepared the atmosphere in the above-mentioned tumbler 18 in the pars basilaris ossis occipitalis 32.

[0013] Next, operation of this example constituted as mentioned above is explained. First, the LCD substrate 12 processed at the process of the preceding paragraph is held by the main arm 84 from the carrier station 72 of the processor set unit 70, is carried in into a brush scrubber 74, and performs brush washing in this. Furthermore, this substrate is washed by high-pressure jet water with the high-pressure jet soaping machine 76, and is dried by the hot plate machine 78. Then, a substrate is introduced to the photoresist coater 10 concerning this invention, after hydrophobing processing is performed with the ad HYUJON processing machine 80. First, the LCD substrate 12 is laid on the above-mentioned chucking 22 by automatic transferring machine like an arm which does not illustrate the chucking 22 of the rotation maintenance means 14 in the state where it was made to move upwards, and suction maintenance of this is carried out. And it is made to descend to a position so that this chucking 22 may be illustrated. Next, while rotating in one the tumbler 18 currently fixed to this by rotating the axis of rotation 26, and the LCD substrate 12 currently attracted by chucking 22, regurgitation supply of the photoresist 5 of the specified quantity is carried out from the processing liquid supply means 16 on this substrate 12, this is diffused over the whole front face of a substrate 12 with a centrifugal force, and the thin film of a photoresist is applied.

[0014] On the other hand, the air which the exhaust air means 20 is discharged through many the air holes 36 and exhaust pipes 54 which were prepared in the pars basilaris ossis occipitalis 32 of a tumbler as it drives and the atmosphere in [at the time of rotation of the above-mentioned tumbler 18] this is shown in an arrow 55, therefore flows in a container 18 from the opening 34 of a tumbler 18 already flows and goes towards this perimeter marginal part in the meantime from the center of a substrate 12 to rotate. especially — this example — **** — if — the distance between the periphery section of the LCD substrate 12, and opening edge 18a of a tumbler 18 — the perimeter of the periphery section of a substrate 12 — crossing — abbreviation, since it is made identically An air current flows and goes for a radial to the periphery section from the core of a substrate 12 to rotate, and without disorder arising in the air current moreover discharged through the gap between this opening edge 18a and the substrate periphery section, it becomes a laminar flow and it will be exhausted. Therefore, since disorder of an air current does not arise in the periphery section of a substrate 12, it becomes possible not to generate, the recoil, i.e., the splash back, of a photoresist, and to form the thin film of uniform thickness also [near the 4 angles of a substrate 12]. Therefore, generating of Myst can be suppressed and it becomes possible to prevent that the yield falls.

[0015] Especially, where the LCD substrate 12 is rotated at the rate of 1500rpm in this example, when the flow of an air current was observed with the smoke by dry ice, from the substrate 12, the air current flowed to the radial straightly, and went to it towards the periphery section, and a turbulent flow did not arise at all, and the recoil of the photoresist by the splash back was not observed, either. Moreover, since the air hole 36 which the atmosphere in a tumbler 18 passes is uniformly formed along with the hoop direction of this pars basilaris ossis occipitalis 32, it can prevent that the atmosphere in a tumbler 18 produces disorder in the air current which is discharged uniformly to the outside fixed container 38 side, and is discharged rather than this point. Moreover, the photoresist shaken off by rotation of a substrate 12 will flow down the side attachment wall of a tumbler 18, and will collect on the drain reservoir 46 of the shape of a crevice of the outside fixed container 38 through the above-mentioned air hole 36, and this drain will be sampled through a drain pipe 50.

[0016] If it was in the above-mentioned example, although the distance between the periphery section of a substrate 12 and the opening edge 42 of a tumbler 18 was set as the horizontal distance of 6mm, and the vertical distance of 7mm, it is not limited to this value but, of course,

can change suitably according to the size of a substrate 12, or the rotational speed of a substrate 12. Moreover, the configuration of a substrate 12 is not limited to four square shapes, either, but can be altogether applied to polygons except circular, such as three square shapes and five square shapes. Furthermore, if it was in the above-mentioned example, although the case where this invention was applied to a photoresist coater was explained, if it is the structure which applies processing liquid to a substrate, it is applicable to any equipments.

[0017]

[Effect of the Invention] As explained above, according to this invention, the following outstanding operation effects can be demonstrated. Since the distance between the periphery section of a processed object and the opening edge of a tumbler was set up so that it might become the same along with the hoop direction, it can prevent certainly that disorder occurs in the air current exhausted. Therefore, there is no recoil of the processing liquid by disorder of an air current, the splash back's generating can be suppressed, and the yield can be raised sharply.

[Translation done.]

*** NOTICES ***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the partial fracture plan showing the processor concerning this invention.

[Drawing 2] It is the cross section of the equipment shown in drawing 1 .

[Drawing 3] It is the outline perspective diagram of the equipment shown in drawing 1 .

[Drawing 4] It is the perspective diagram showing the processor set unit in which the photoresist coater etc. was carried.

[Drawing 5] It is the outline perspective diagram showing the conventional processor.

[Description of Notations]

- 2 12 LCD substrate (processed object)
- 5 Photoresist (Processing Liquid)
- 10 Photoresist Coater (Processor)
- 14 Rotation Maintenance Means
- 16 Processing Liquid Feeder
- 18 Tumbler
- 18a Opening edge
- 20 Exhaust Air Means
- 36 Air Hole
- 38 Outside Fixed Container
- 46 Drain Reservoir
- 50 Drain Pipe
- 54 Exhaust Pipe
- 70 Processor Set Unit
- 74 Brush Scrubber
- 76 High-Pressure Jet Soaping Machine
- 78 Hot Plate Machine
- 80 Ad HYUJON Processing Machine

[Translation done.]